US Army Corps
of Engineers
North Central Division

GREAT LAKES LEVELS

Update Letter No. 83 June 4, 1992

USEPA's Assessment and Remediation of Contaminated Sediments Program

The Great Lakes represent one of the most fragile ecosystems in the world. Their enormous size and long water retention time make those who rely on them -- fish and other aquatic animals and plants, wildlife and humans -- extremely susceptible to contamination. For example, it takes nearly 500 years for water entering Lake Superior to flush out and about 100 years for water entering Lake Michigan to eventually flush out. As a result, once persistent toxic chemicals enter the lakes, they are generally in the ecosystem and food chain to stay, at least for many generations to come.

This is particularly true for the toxic chemicals that are incorporated into the sediments covering the bottoms of the rivers and harbors, in and around the Great Lakes. While these chemicals may have disappeared from sight, smell, and taste, they have not gone away. They may be adsorbed directly from the sediments into the bodies of tiny, bottom-dwelling organisms that fish eat, or they may be resuspended to the water column by the movements of carp and other bottom-dwelling fish, by ships, by wind, currents, and wave action. In these ways, they get into the food chain and eventually into the bodies of people who eat fish and/or water fowl.

The Clean Water Act (Federal Water Pollution Control Act of 1987) recognized the urgent ecological and human health risks that the contaminated sediments pose for the Great Lakes ecosystem; and, it outlined goals to ensure that efforts were made to clean them up. Section 118(c)(3) of the Clean Water Act authorized an annual budget of $4.4 million to go to the U.S. Environmental Protection Agency's

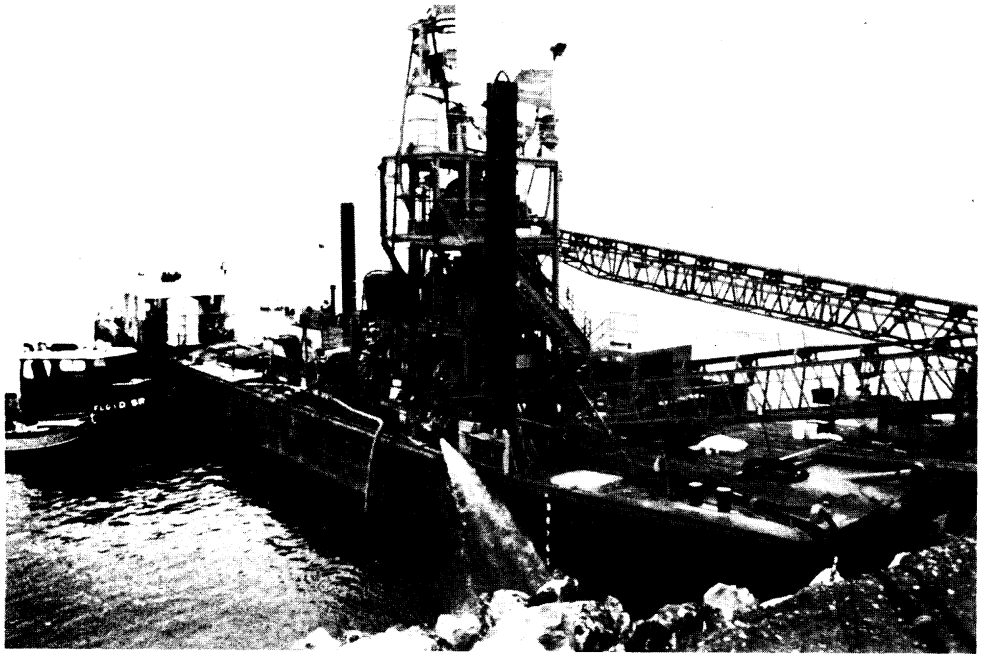

Figure 1. Sediment washing demonstration at Saginaw, Michigan

(USEPA) Great Lakes National Program Office (GLNPO) to conduct a five-year study and demonstration program on the best ways to clean up contaminated sediments (Figure 1). The program was to be focused on five of the 43 Areas of Concern (AOCs), on the Great Lakes identified by the governments of the U.S. and Canada as suffering from one or more of 14 use impairments. The five AOCs to be studied (Figure 2) under the program are: Ashtabula River, Ohio; Buffalo River, New York; Grand Calumet River, Indiana; Saginaw River and Bay, Michigan; and Sheboygan River, Wisconsin.

In response to the Clean Water Act, USEPA initiated the Assessment and Remediation of Contaminated Sediment (ARCS) Program in spring of 1988. The Great Lakes Critical Programs Act of 1990 extended the deadline for the ARCS Program to December 1993. The overall objectives of the ARCS Program are:

1. To assess the nature and extent of bottom sediment contamination in selected Great Lakes AOCs (Figure 3);

2. To evaluate and demonstrate remedial options; and,

3. To provide guidance and tools for assessment and remedial actions, to various levels of government in the U.S. and Canada, in the implementation of clean-up or "Remedial Action" Plans for AOCs and future evaluation of other areas.

ARCS has convened experts from a number of federal and state agencies, universities, and citizen groups to work together on the project. The Corps support to this program is coordinated by the North Central Division.

To accomplish the many and varied tasks necessary to meet the objectives of the program, four work groups have been formed:

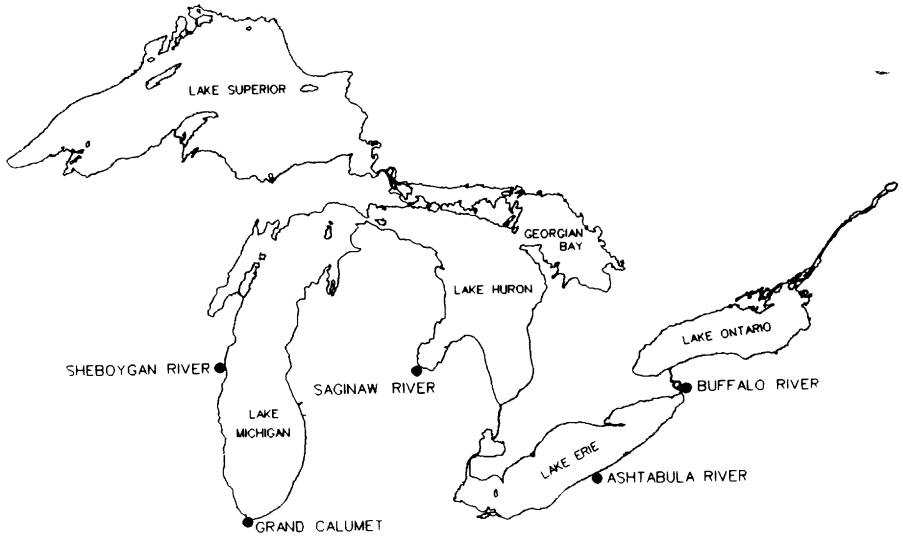

Figure 2. Map showing the five Areas of Concern (AOC) in the Great Lakes

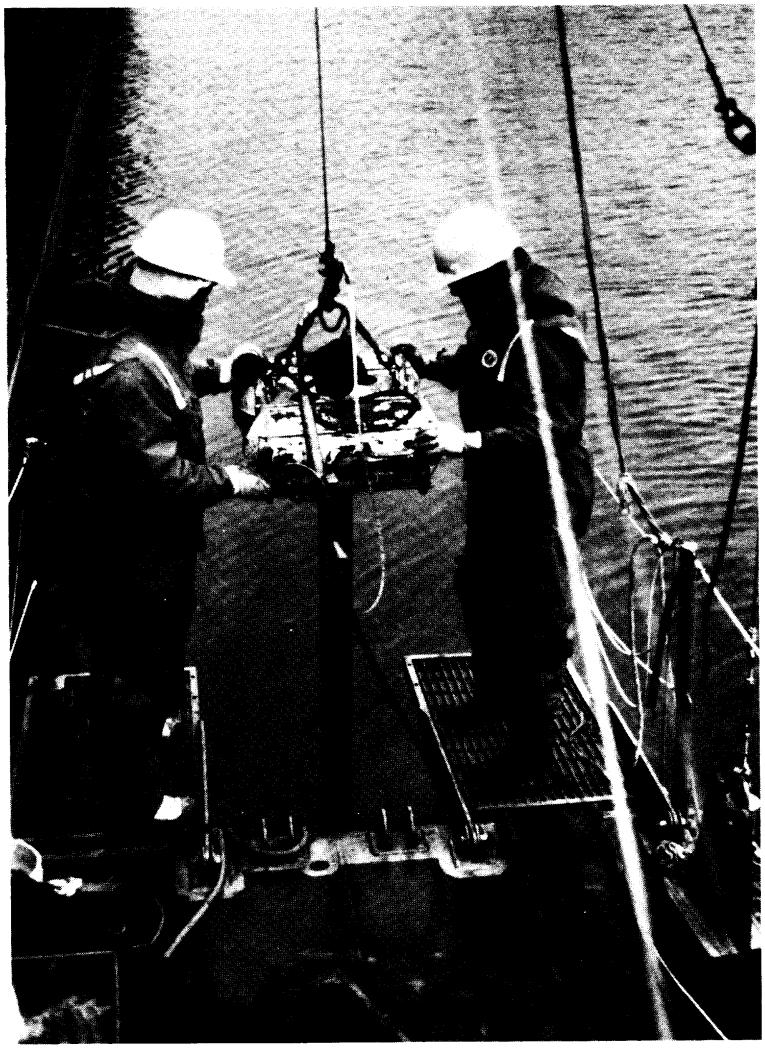

Figure 3. Sediment sampling at Indiana Harbor, Grand Calumet River

Great Lakes Basin Hydrology

The precipitation, water supplies, and outflows for the lakes are provided in Table 1. Precipitation data include the provisional values for the past month and the year-to-date and long-term averages. The provisional and long-term average water supplies and outflows are also shown.

Table 1
Great Lakes Hydrology[1]

PRECIPITATION								
BASIN	MAY				YEAR-TO-DATE			
	1992*	AVG.**	DIFF.	% OF AVG.	1992*	AVG.**	DIFF.	% OF AVG.
Superior	2.9	2.7	0.2	107	9.7	9.8	-0.1	99
Michigan-Huron	1.4	3.0	-1.6	47	10.0	11.5	-1.5	87
Erie	2.5	3.3	-0.8	76	13.7	13.7	0.0	100
Ontario	3.4	3.1	0.3	110	15.0	13.6	1.4	110
Great Lakes	2.2	3.0	-0.8	73	11.0	11.6	-0.6	95

LAKE	MAY WATER SUPPLIES***		MAY OUTFLOW[3]	
	CFS[2]	AVG.[4]	CFS[2]	AVG.[4]
Superior	178,000	186,000	82,000	75,000
Michigan-Huron	112,000	251,000	186,000[5]	189,000
Erie	31,000	46,000	222,000[5]	213,000
Ontario	62,000	60,000	273,000	257,000

*Estimated (inches) **1900-90 Average (inches)
***Negative water supply denotes evaporation from lake exceeded runoff from local basin.

[1]Values (excluding averages) are based on preliminary computations.
[2]Cubic Feet Per Second [3]Does not include diversions [4]1900-89 Average (cfs)
[5]Reflects effects of ice/weed retardation in the connecting channels.

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Engineering/Technology; Toxicity/ Chemistry; Risk Assessment/ Modeling; and Communication/ Liaison. Their work efforts and a sampling of their accomplishments are summarized below.

The Engineering/Technology Work Group (ET) is headed by Dr. Steve Yaksich, from the Corps of Engineers' Buffalo District. ET is to evaluate sediment remediation technologies and to select promising technologies for demonstration, both in the laboratory and in the field.

The efforts to identify, select, and demonstrate these sediment treatment technologies began with a literature survey on the current state-of-the-art sediment treatment technology available. The survey, completed by the Corps' Waterways Experiment Station in December 1990, considered over 250 process options for sediment treatment, and identified 13 technologies that were worthy of further study by the ARCS program. The 13 selected technologies were tested in the laboratory during 1991-92 and four were selected for demonstration at the sites of each of the five ARCS Areas of Concern (AOCs).

The field demonstrations, called "pilot demos" by the ET, began last fall with the demonstration of a low-temperature thermal desorption technology applied to sediments removed from the Buffalo River (Figure 4). The Corps' Buffalo District executed this demo. This technology removes the organic contaminants, such as polynuclear aromatic hydrocarbons, from the sediment by heating them to temperatures just below the incineration level. Also begun last fall, was the demonstration of a sediment washing technology at the Saginaw River and Bay area. (Figures 1 and 5). This demo was directed by the Corps' Detroit District. This technology separates coarse and fine grained sediments to concentrate the contaminants into a smaller volume of material.

Although the pilot demo at Saginaw River and Bay was temporarily shut down over the winter, it resumed operation this May. May is also the month for

Figure 4. Low temperature thermal desorption demonstration at Buffalo, NY

resuming the longest-running pilot demo, which is at the Sheboygan River. In cooperation with the Superfund project at that site, ARCS will demonstrate the use of indigenous microorganisms to biodegrade the polychlorinated biphenyls (PCBs) that are of concern in the Sheboygan River AOC. This demo will take place in a confined treatment facility built on Tecumseh Motors property in Sheboygan Falls, Wisconsin, and will run through the fall of 1993.

June marks the start of a solvent extraction demonstration at the Grand Calumet River. The Corps' Chicago District office is undertaking this project. Organic contaminants will be removed from the sediments, using a chemical solvent. The final ARCS pilot demo will take place at the Ashtabula River, Ohio, wher another low-temperature thermal desorption unit will be tested in August 1992.

The Toxicity/Chemistry Work Group (TC), headed by Dr. Phil Ross of the Citadel, is the group that is furthest along in its work -- i.e., completion of field and laboratory activities for the ARCS Program. Sediment chemistry surveys were completed in three of the ARCS AOCs in the first years of the program. Laboratory toxicity tests, and surveys of fish abnormalities and benthic community health are nearly complete.

Sediment is increasingly gaining recognition as one of the primary sources of contaminants that can cause cancer, birth defects, fish tumor, and other health impairments. Hence, TC's role is to collect and quantify the human and ecological impact data that will help in the ARCS decision making process.

The Risk Assessment/Modeling Work Group (RAM) is headed by Dr. Marc Tuchman, of USEPA Region 5, Water Division. RAM is developing assessment methods for determining the human health and ecological impacts from the implementation of several remediaton alternatives, as well as the impacts of taking no action at a site.

RAM will use a series of sophisticated computer models that predict the behavior of water currents, sediment transport, food chain interactions, and chemical fate and transport. Typically, a tremendous amount of data is needed for these models. RAM hopes to demonstrate that the models can produce accurate results with a smaller data set, thus reducing the costs of using them as a decision making tool.

The chair of the Communication/ Liaison Work Group (CL) is jointly held by Phil Hoffman of USEPA Region 5, Public Affairs and Glenda Daniel, Director of the Lake Michigan Federation. CL is charged with preparing up-to-date information about ARCS and its work groups on a regular basis and disseminating i to the public, interested federal, state and local agencies, and elected officials in the U.S. and Canada. The main vehicle for this information dissemination is the ARCS Update, a fact sheet that is produced by the CL and distributed to those on the ARCS mailing list.

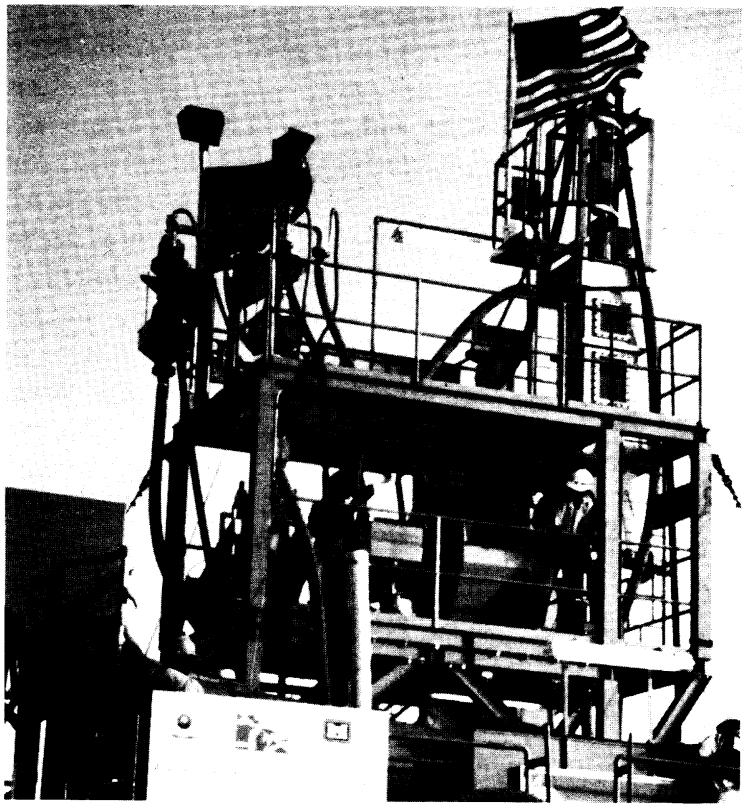

Figure 5. Sediment washing demonstration at Saginaw, Michigan

For more information about ARCS, or to get on the ARCS mailing list, contact:

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